

THE CLAIMS

What is claimed is:

- 5 **1.** A method of forming a structure that includes a relaxed or pseudo-relaxed layer on a substrate comprising:
- growing an elastically stressed layer of semiconductor material on a donor substrate;
- forming a glassy layer of a viscous material on the stressed layer;
- 10 removing a portion of the donor substrate to form a structure that includes the glassy layer, the stressed layer and a surface layer; and
- heat treating the structure at a temperature of at least a viscosity temperature of the glassy layer to relax the stressed layer.
- 15 **2.** The method of claim 1 wherein the glassy layer is also formed on a receiving substrate and the structure includes the receiving substrate bonded to the glassy layer.
- 20 **3.** The method of claim 3 wherein the glassy layer is formed on the receiving substrate prior to bonding with the stressed layer.
- 25 **4.** The method of claim 1 further comprising using a controlled treatment that includes a second viscosity temperature to transform at least a portion of the surface layer into a second glassy layer.
- 5.** The method of claim 4 wherein heat treating occurs during or after the formation of the second glassy layer.

6. The method of claim 4 which further comprises removing the second glassy layer.

7. The method of claim 1 which further comprises inducing crystal
5 growth on the structure using a semiconductor material.

8. The method of claim 1 wherein the glassy layer is formed on the receiving substrate, and wherein, before bonding, a thin layer is formed on the stressed layer having a thickness that is less than that of the stressed
10 layer.

9. The method of claim 1 wherein the glassy layer comprises a semiconductor material layer that is grown on the stressed layer and which further comprises completing a controlled treatment that transforms
15 at least a portion of the semiconductor material layer into a viscous material at a viscosity temperature.

10. The method of claim 3 which further comprises forming a bonding layer on the receiving substrate prior to forming the glassy layer thereon.
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11. The method of claim 10 wherein the bonding layer is an SiO₂ material.

12. The method of claim 1 which further comprises forming a
25 weakened zone in the donor substrate for removal by detachment wherein the weakened zone is formed at a depth value that is close to the thickness of the surface layer.

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13. The method of claim 12 wherein the weakened zone is formed by implanting atomic species into the donor substrate before the bonding step.

5 **14.** The method of claim 1 wherein the donor substrate is formed by forming a porous layer on a crystalline backing substrate, and growing a crystal layer on the porous layer, wherein the porous layer forms a weakened area in the donor substrate.

10 **15.** The method of claim 1 wherein the removing step comprises selective chemical etching.

16. The method of claim 1 wherein the glassy layer comprises an electrically insulating material.

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17. The method of claim 18 wherein the glassy layer is SiO_2 .

18. The method of claim 1 wherein the donor substrate is Si, and the stressed layer is $\text{Si}_{1-x}\text{Ge}_x$.

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19. The method of claim 1 wherein the glassy layer is a material layer grown on the stressed layer, and which further comprises completing a controlled thermal oxidization treatment for transforming at least a portion of the Si material layer into SiO_2 to form a SiO_2 glassy layer.

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20. The method of claim 4 wherein forming the second glassy layer comprises using a controlled thermal oxidization treatment for transforming at least a portion of Si in the surface layer into SiO_2 to form a second SiO_2 glassy layer.

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21. The method of claim 20 which further comprises, after the heat treating step, using a chemical treatment based on hydrofluoric acid to remove the second glassy layer.
- 5 22. The method of claim 6 which further comprises growing a crystal layer on the structure using a Si material.
23. The method of claim 1 wherein the glassy layer is electrically insulating and the structure is a semiconductor-on-insulator structure.
- 10 24. The method of claim 1 further comprising preparing components from at least one of the stressed layer or an epitaxial layer.
25. A structure comprising:
- 15 a receiving substrate having a top surface;
 a glassy layer on the top surface of the receiving substrate; and
 a relaxed $\text{Si}_{1-x}\text{Ge}_x$ layer on the glassy layer.
26. The structure of claim 25 which further comprises another glassy
20 layer on the relaxed $\text{Si}_{1-x}\text{Ge}_x$ layer.